

WHAT IS CLAIMED IS:

1. A method for fabricating a damage resistant photomask, the method comprising:

- 5 forming a photomask pattern on a substrate; and
 forming a transparent, protective coating on the photomask pattern.

10 2. The method of Claim 1, wherein forming the transparent, protective coating on the photomask pattern comprises coating the photomask pattern with a material that has an electrical resistivity of at least ten ohm meters.

15 3. The method of Claim 2, wherein the material comprises spin-on glass.

20 4. The method of Claim 1, wherein forming the photomask pattern comprises:
 forming a layer of absorber on the substrate; and
 removing portions of the absorber from the substrate.

25 5. The method of Claim 1, wherein forming the photomask pattern comprises:
 forming a layer of absorber on the substrate; and
 removing portions of the absorber from the substrate to form a pattern with clear areas and opaque areas; and
 removing material from the substrate in one or more
30 of the clear areas to form one or more trenches in the substrate.

6. The method of Claim 1, wherein forming a transparent, protective coating on the photomask pattern comprises:

5 depositing material on the photomask pattern; and
curing the material to form the transparent, protective coating.

7. The method of Claim 1, further comprising planarizing the transparent, protective coating.

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8. The method of Claim 1, further comprising forming an antireflective layer on the transparent, protective coating.

15 9. The method of Claim 1, further comprising attaching a pellicle over the transparent, protective coating.

20 10. The method of Claim 1, further comprising forming the transparent, protective coating from a material selected from the group consisting of silicon dioxide (SiO_2), aluminum oxide (Al_2O_3), aluminum nitride (AlN), silicon nitride (Si_3N_4), tantalum oxide (Ta_2O_5), yttrium oxide (Y_2O_3), magnesium fluoride (MgF_2), magnesium
25 oxide (MgO), zirconium oxide (ZrO_2), lithium fluoride (LiF), aluminum fluoride (AlF_3), and calcium fluoride (CaF_2).

11. The method of Claim 1, wherein forming the transparent, protective coating comprises using a technique selected from the group consisting of physical vapor deposition, chemical vapor deposition, and gas
5 phase deposition techniques to form the transparent, protective coating.

11. The method of Claim 1, wherein forming the transparent, protective coating comprises using a technique selected from the group consisting of physical vapor deposition, chemical vapor deposition, and gas phase deposition techniques to form the transparent, protective coating.

12. A damage resistant photomask, comprising:
a photomask pattern formed on a substrate; and
a transparent, protective layer formed on the
photomask pattern.

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13. The damage resistant photomask of Claim 12,
wherein the transparent, protective layer comprises a
material that has an electrical resistivity of at least
ten ohm meters.

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14 The damage resistant photomask of Claim 13,
wherein the material comprises spin-on glass.

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15. The damage resistant photomask of Claim 12,
further comprising:

the substrate formed from transparent material;
a patterned layer of absorber formed on the
substrate; and

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the transparent, protective layer covers the
absorber.

16. The damage resistant photomask of Claim 12,
further comprising:

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the substrate formed from transparent material;
a patterned layer of absorber formed on the
substrate;

trenches formed in the substrate; and
the transparent, protective layer coats the
absorber.

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17. The damage resistant photomask of Claim 12, further comprising an antireflective layer formed on the transparent, protective layer.

5 18. The photomask of Claim 12, further comprising a pellicle attached over the transparent, protective layer.

19. The photomask of Claim 12, wherein the transparent, protective coating comprises a material
10 selected from the group consisting of silicon dioxide (SiO_2), aluminum oxide (Al_2O_3), aluminum nitride (AlN), silicon nitride (Si_3N_4), tantalum oxide (Ta_2O_5), yttrium oxide (Y_2O_3), magnesium fluoride (MgF_2), magnesium oxide (MgO), zirconium oxide (ZrO_2), lithium fluoride (LiF), and
15 aluminum fluoride (AlF_3).

20. The photomask of Claim 12, wherein the transparent, protective coating comprises a material deposited using a technique selected from the group
20 consisting of physical vapor deposition, chemical vapor deposition, and gas phase deposition.

21. A method for applying a pattern to a wafer, the method comprising:

providing a damage resistant photomask that features a pattern of opaque and clear areas and a protective

5 layer coating the pattern of opaque and clear areas;

forming a layer of photoresist on a wafer;

projecting electromagnetic radiation through the clear areas and the protective layer onto the photoresist; and

10 developing the photoresist to leave a pattern of photoresist on the wafer that corresponds to the pattern of opaque and clear areas on the damage resistant photomask.

15 22. The method of Claim 21, further comprising projecting electromagnetic radiation through the clear areas, the protective layer, and a pellicle attached to the photomask.